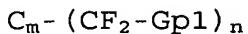


## CLAIMS

1. An ion-dissociative functional compound represented by the chemical formula 1 below.

Chemical formula 1:



(where, m is a natural number for carbon atoms to form a spherical carbon molecule; n is a natural number; and Gp1 denotes an ion-dissociative group.)

2. The ion-dissociative functional compound as defined in claim 1, wherein  $C_m$  denotes a fullerene molecule.

3. The ion-dissociative functional compound as defined in claim 1, wherein the ion-dissociative group is a proton-dissociative group selected from the group consisting of hydrogensulfate ester group ( $-OSO_2OH$ ), sulfonic acid group ( $-SO_2OH$ ), dihydrogen phosphate ester group ( $-OPO(OH)_2$ ), hydrogen phosphate ester group ( $-OPO(OH) -$ ), phosphono group ( $-PO(OH)_2$ ), carboxyl group ( $-COOH$ ), sulfoneamide group ( $-SO_2-NH_2$ ), sulfoneimide group ( $-SO_2-NH-SO_2 -$ ), methanedisulfonyl group ( $-SO_2-CH_2-SO_2 -$ ), carboxamide group ( $-CO-NH_2$ ), and carboximide group ( $-CO-NH-CO -$ ).

4. An ionic conductor which contains the ion-dissociative functional compound defined in any of claims

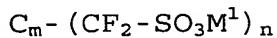
1 to 3.

5. A method for producing an ion-dissociative functional compound, said method including the step of reacting  $C_m$  (where  $m$  is a natural number for carbon atoms to form a spherical carbon molecule) with  $I-CF_2-SO_2F$ , thereby synthesizing  $C_m-(CF_2-SO_2F)_n$  (where  $n$  is a natural number).

6. The method for producing the ion-dissociative functional compound as defined in claim 5, wherein the step of synthesizing  $C_m-(CF_2-SO_2F)_n$  employs  $C_6F_6$  and/or  $CS_2$  as a solvent.

7. The method for producing the ion-dissociative functional compound as defined in claim 5, which includes the step of hydrolyzing  $C_m-(CF_2-SO_2F)_n$  under a basic condition, thereby giving the ion-dissociative functional compound represented by the chemical formula 2 below.

Chemical formula 2:

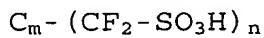


(where,  $m$  is a natural number for carbon atoms to form a spherical carbon molecule;  $n$  is a natural number; and  $M^1$  denotes an alkali metal atom.)

8. The method for producing the ion-dissociative functional compound as defined in claim 5, which includes the step of substituting a hydrogen ion for the cation of

the alkali metal atom  $M^1$  of the ion-dissociative functional compound represented by the chemical formula 2 above, thereby producing the proton-dissociative functional compound represented by the chemical formula 3 below.

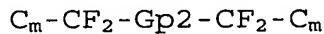
Chemical formula 3:



(where,  $m$  is a natural number for carbon atoms to form a spherical carbon molecule; and  $n$  is a natural number.)

9. An ion-dissociative functional compound having the linkage structure represented by the chemical formula 4 below.

Chemical formula 4:



(where,  $m$  is a natural number for carbon atoms to form a spherical carbon molecule; and  $Gp2$  denotes an ion-dissociative group.)

10. The ion-dissociative functional compound as defined in claim 9, wherein  $C_m$  is a fullerene molecule.

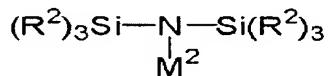
11. The ion-dissociative functional compound as defined in claim 9, wherein the ion-dissociative group is a sulfoneimide group.

12. A method for producing an ion-dissociative functional compound, said method comprising the steps of:

reacting  $C_m$  (where  $m$  is a natural number for carbon atoms to form a spherical carbon molecule) with  $I-CF_2-SO_2F$  to give  $C_m-(CF_2-SO_2F)_n$  (where  $n$  is a natural number); and

reacting said  $C_m-(CF_2-SO_2F)_n$  with a compound represented by the chemical formula 5 below.

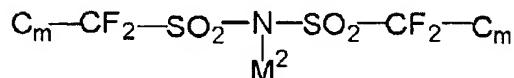
Chemical formula 5:



(where  $M^2$  denotes an alkali metal atom or  $-Si(R^2)_3$ , and  $R^2$  denotes an alkyl group.)

13. The method for producing the ion-dissociative functional compound as defined in claim 12, wherein the ion-dissociative functional compound has a linkage structure represented by the chemical formula 6 below.

Chemical formula 6:



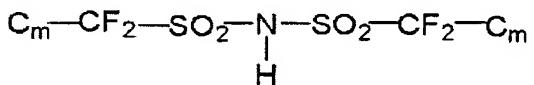
(where  $m$  is a natural number for carbon atoms to form a spherical carbon molecule; and  $M^2$  denotes an alkali metal atom.)

14. The method for producing the ion-dissociative functional compound as defined in claim 12,

wherein  $C_6F_6$  and/or  $CS_2$  may be employed as solvents in the step to give  $C_m-(CF_2-SO_2F)_n$ .

15. The method for producing the ion-dissociative functional compound as defined in claim 12, which includes the step of substituting a hydrogen ion for the cation of the alkali metal atom  $M^2$  of the ion-dissociative functional compound having the linkage structure represented by the chemical formula 6 above, thereby producing the proton-dissociative functional compound represented by the chemical formula 7 below.

Chemical formula 7:



(where,  $m$  is a natural number for carbon atoms to form a spherical carbon molecule.)

16. An ionic conductor of fullerene derivative which has a difluoromethylene group combining with both the ion-dissociative group (Gp3) and the fullerene molecule.

17. The ionic conductor as defined in claim 16, wherein the fullerene molecule is  $C_f$  ( $f = 36, 60, 70, 76, 78, 80, 82, 84$ , and so on).

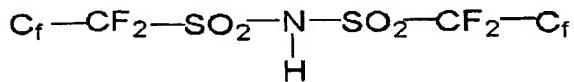
18. The ionic conductor as defined in claim 17, wherein the fullerene molecule is  $C_{60}$  or  $C_{70}$ .

19. The ionic conductor as defined in claim 16, wherein at least one of the ion-dissociative groups (Gp3) is a proton-dissociative group selected from the group consisting of hydrogensulfate ester group (-OSO<sub>2</sub>OH), sulfonic acid group (-SO<sub>2</sub>OH), dihydrogen phosphate ester group (-OPO(OH)<sub>2</sub>), hydrogen phosphate ester group (-OPO(OH)-), phosphono group (-PO(OH)<sub>2</sub>), carboxyl group (-COOH), sulfoneamide group (-SO<sub>2</sub>-NH<sub>2</sub>), sulfoneimide group (-SO<sub>2</sub>-NH-SO<sub>2</sub>-), methanedisulfonyl group (-SO<sub>2</sub>-CH<sub>2</sub>-SO<sub>2</sub>-), carboxamide group (-CO-NH<sub>2</sub>), and carboximide group (-CO-NH-CO-).

20. The ionic conductor as defined in claim 16, wherein fullerene molecules are joined together by a linking group.

21. The ionic conductor as defined in claim 20, wherein the linking group contains a sulfoneimide group and has the linking structure represented by the chemical formula 8 below.

Chemical formula 8:



(where C<sub>f</sub> denotes the fullerene molecule as defined above.)

22. The ionic conductor as defined in claim 16, wherein the polymer has a proton-dissociative group selected from the group consisting of hydrogensulfate ester group (-OSO<sub>2</sub>OH), sulfonic acid group (-SO<sub>2</sub>OH), dihydrogen phosphate ester group (-OPO(OH)<sub>2</sub>), hydrogen phosphate ester group (-OPO(OH)-), phosphono group (-PO(OH)<sub>2</sub>), carboxyl group (-COOH), sulfoneamide group (-SO<sub>2</sub>-NH<sub>2</sub>), sulfoneimide group (-SO<sub>2</sub>-NH-SO<sub>2</sub>-), methanedisulfonyl group (-SO<sub>2</sub>-CH<sub>2</sub>-SO<sub>2</sub>-), carboxamide group (-CO-NH<sub>2</sub>), and carboximide group (-CO-NH-CO-).

23. The ionic conductor as defined in claim 16, which is in the form of membrane composed of the ionic conductor and a polymer binder mixed or compounded together.

24. An electrochemical device constructed such that an ionic conductor is held between a first electrode and a second electrode and it conducts ions from the first electrode to the second electrode, wherein the ionic conductor is one which is defined in any of claims 16 to 23.

25. The electrochemical device as defined in claim 24, wherein the ionic conductor is in the form of film having a thickness of 20  $\mu\text{m}$  to 30  $\mu\text{m}$ .

26. The electrochemical device as defined in

claim 24, wherein the ionic conductor is a proton conductor, and the electrochemical device is a fuel cell.

27. The electrochemical device as defined in claim 26, wherein the ionic conductor is in the form of film with a thickness large enough to exhibit the self-humidifying properties.

28. The electrochemical device as defined in claim 26, which is a fuel cell that relies on hydrogen or methanol for its energy source.